



## MEMORANDUM ON EPIDEMIC CATARRHS AND INFLUENZA.

*The general measures needing to be adopted by patients and by the public are indicated in the paragraphs to which a star is affixed.*

Each winter a large number of deaths from diseases of the respiratory organs occur. These on an average are three or four times as numerous in each month from November to March as in each month from July to September. In severe winters the excess is even greater.

The total deaths from diseases of the respiratory organs (not including pulmonary tuberculosis) in England and Wales in 1913, prior to the War, was 83,179, or approximately one-sixth of the deaths from all causes; and of this number 37,615 were caused by pneumonia (all forms) and 38,554 by bronchitis. The registered death-rate from these two chief respiratory diseases is lower than in the past, having gradually declined; and it is probable that, after allowing for varying accuracy of certification of deaths, this decline is real.

The number of deaths from respiratory diseases varies greatly in different years. Thus, stating the facts as rates per million of population, in 1902 pneumonia was the registered cause of 1,409 deaths, in the next year of 1,222 deaths; in 1907 of 1,353 deaths, in the next year of 1,188 deaths; in 1915 of 1,359 deaths and in 1916 of 1,070 deaths; and the years which showed excess of registration of deaths from pneumonia usually also showed a somewhat similar excess in bronchitis.

The age distribution of deaths from these diseases is shown below.† One-half of the deaths from pneumonia and one-fifth of those from bronchitis occur in children under 5; both diseases and especially bronchitis are heavy causes of death as old age approaches; but one-third of the total toll on life of pneumonia and one-fourth of that of bronchitis is taken during the fifty years of life, 15-65. As compared with this, over a half of all the deaths returned as due to influenza occur between 15 and 65 years of age.

The loss of life from bronchitis and pneumonia is not completely stated in the preceding figures. These diseases hasten the death of tuberculous patients; and a large proportion of the deaths registered as due to Measles, numbering 10,644 in 1913

† Out of 100 deaths at all ages in London in 1911, the number at each age-period was as follows:—

	0-5	5-15	15-25	25-45	45-65	65 and over.	All ages.
Pneumonia ...	49.9	3.4	2.3	12.4	18.0	14.0	100
Bronchitis ...	21.4	0.6	0.4	3.6	21.6	52.4	100
Influenza ...	7.0	2.6	4.0	15.8	32.2	38.4	100

*Med. pamph.*  
*V. 123.*

and 16,445 in 1915, and from Whooping Cough, numbering 5,458 in 1913 and 8,143 in 1915, are caused by infections secondary to Measles, which produce bronchitis or pneumonia.

Bronchitis and broncho-pneumonia commonly originate in a naso-pharyngeal catarrh. Death from chronic bronchitis is commonly preceded by months or years of recurrent disability arising from bronchial catarrhs. These catarrhs produce gradually increasing emphysema and secondary circulatory disturbance. Lobar pneumonia has a more sudden onset and a definite short course; and is most often due to invasion by pneumococci.

The micro-organisms usually associated with a "common cold" are the *micrococcus catarrhalis*, or the *pneumococcus*; although other organisms may be found. When naso-pharyngeal catarrh occurs during an epidemic of Influenza, and sometimes apart from this, the *Bacillus influenzae* of Pfeiffer may be present. In bronchitis and in pneumonia following an ordinary catarrh, or still oftener when the pneumonia occurs during an attack of Measles or Influenza, the pneumococcus, or occasionally the Pfeiffer bacillus, may be the predominant organism; in Measles—and this also occurs in some epidemics of Influenza—infection by a hæmolytic streptococcus may be a marked characteristic.

At intervals which are uncertain and sometimes prolonged, not only is the mortality from bronchitis and pneumonia exceptionally heavy, but it is clear that these diseases are intimately associated with widespread Influenza.

### Influenza.

Influenza has been identified historically for several centuries, appearing and causing great havoc in many countries at intervals which may have been so prolonged as to create the impression on its reappearance that a new disease had emerged. This was so in the pandemic of 1889-92,† although 43 years earlier (1847-8) and in 1803, 1833, and 1837-8 epidemics of Influenza occurred in this country. Prior to 1890 but few deaths had been registered as due to Influenza, but in the three years 1890-92, 4,523, 16,686, and 15,737 deaths successively were ascribed to this cause. Since then Influenza has continued to be returned as a common cause of death each year, the lowest number of deaths returned under this heading in any year being 3,753 in 1896 and 4,334 in 1911, as compared with 12,417 in 1899, 16,245 in 1900, 10,112 in 1908 and 10,471 in 1915. Either Influenza has remained endemic after its epidemic outburst in 1889-92, or cases of severe catarrh followed by fatal bronchitis or pneumonia have continued to be returned as Influenza, although not of this nature.

The real difficulty is that of defining Influenza. Its most characteristic feature is its occurrence at long intervals as an epidemic which spreads rapidly from country to country and

† For an exhaustive account of this epidemic see Dr. Franklin Parsons' two Reports to the Local Government Board. (Cd. 6387 and Cd. 7051.)

from continent to continent, and which affects probably a much higher proportion of the total population than any other infectious disease. The rapidity of its spread is such as to suggest that it occurs irrespective of human contact; but the careful inquiries made and collected by Dr. Franklin Parsons lend no support to this view. Its apparently simultaneous origin in widely separated communities is explained by the occurrence of unrecognised cases preceding the main outbreak, by the extremely short incubation period of the disease—not more than one to three days—and by the extremely rapid multiplication of cases which this permits.

Towards the latter part of the pandemic of 1889–92 Pfeiffer described the bacillus which he had discovered. It is an extremely small cocco-bacillus, Gram-negative, showing when examined with a lens fairly characteristic minute colonies on media which contain blood. Microscopic and cultural examination afford fairly typical results; but no specific agglutination tests are available. The fact that this bacillus, if it be not the causal micro-organism of Influenza, produces much of the mischief in this disease, is confirmed by its presence in large numbers in immediate relation to minute lesions occurring in the lung. It has occasionally been isolated from the blood and the spleen.

Certain other facts need, however, to be noted. The Pfeiffer bacillus is occasionally discovered in bronchial secretions when there is no suspicion of Influenza. On the other hand, in a considerable number of outbreaks indistinguishable clinically from Influenza, the Pfeiffer bacillus has not been found, or in only a small minority of the total cases, the predominant organisms in these cases being the *M. Catarrhalis*, the pneumococcus, or a haemolytic streptococcus. The last named has especially been found in empyema following Influenza; and its presence is an outstanding feature of the pneumonia of measles.

The failure in a number of recent outbreaks which clinically resembled Influenza to find the Pfeiffer bacillus is noteworthy. It must, however, be borne in mind that this bacillus is easily overgrown in cultures and especially in cultures from sputum, and may consequently be overlooked.

It is still an open question whether Pfeiffer's bacillus is the specific cause of Influenza, or whether in relation to this disease it occupies a position analogous to that of the pneumococcus or streptococcus, though perhaps a more important cause than these of the secondary complications of Influenza.

In view of the above considerations, it is impossible to set up an unerring bacteriological test for Influenza; and its clinical symptoms are so multiform as not to permit of a differential clinical diagnosis in all cases. The one distinctive feature of the disease is its occasional occurrence in epidemics and in world-wide pandemics. It is impracticable, however, to base a diagnosis on this characteristic; for it would exclude cases occurring in the intervals of an epidemic, and ordinary non-influenzal catarrhs would be included.

For the present it must remain uncertain to what extent severe catarrhs or febrile attacks without catarrh occurring in inter-epidemic periods are true Influenza ; and whether when Influenza becomes widely prevalent this occurs as the result of increased virulence of disease already prevalent or by introduction from some unknown focus of a new strain of disease. Attack by Influenza enhances the virulence of pneumococci and streptococci—previously present possibly as harmless saprophytes—and much of the mischief caused by Influenza is due to this.

We are ignorant as to the causes which lead to the occasional world-wide spread of Influenza.

### **Preventive Measures.**

If one attack conferred any considerable immunity against repeated attack, Influenza would become much less prevalent ; but, unfortunately, this is not so ; and the difficulty of prevention is correspondingly increased.

\*The general preventive measures available are the same for an ordinary catarrh and for the more serious Influenza. An initial difficulty in securing their adoption is that the patient for several days may not—except in cases—recognise the serious nature of his illness. It is probable that infection is chiefly spread during the earlier stages.

### **Measures concerning Patients.**

*Notification.*—Its varied manifestations and the difficulty in securing early and decisive diagnosis, especially in the large proportion of milder cases for which medical guidance is not obtained, are serious difficulties in the way of any attempt to enforce compulsory notification of Influenza ; and this cannot be recommended under present circumstances as likely to be of practical use.

\**Isolation.*—If every person suffering from a fever with or without catarrh were willing and able to stay at home for a few days, the spread of disease in factories and workshops, offices and shops, schools and other institutions, would be greatly reduced. Apart from actual reduction in the number of cases, increased slowness of spread can thus be secured ; and this is likely to diminish the risk that successive cases will become increasingly severe.

\**Personal Precautions.*—It is most important to avoid scattering infection in sneezing and coughing. A handkerchief should always be employed to intercept droplets of mucus, and the handkerchief should be boiled, or burnt if of paper. Expectoration should be received in a special receptacle, its contents being subsequently disinfected or burnt.

\*There is no ground for believing that the virus of influenza can multiply or even persist outside the human body. General disinfection of premises after Influenza is not required, but a thorough washing and cleansing of rooms and their contents and washing of articles of bedding or apparel is desirable.

*\*Relapses.*—Influenza is very liable to relapse ; and pneumonia may occur as late as well as an early complication. Relapse is less likely if the patient goes to bed on the first onset of symptoms and remains there till all fever has gone ; avoidance of chill or over-exertion during convalescence is also of great importance as a means of avoiding relapse or complications.

*\*Prophylaxis of complications.*—There is ground for thinking that the broncho-pneumonia which is the most common cause of death in Measles may originate in a septic condition of the mouth, fauces, or naso-pharynx ; and for this reason nurses are being widely employed to assist mothers in remedying this condition. During attacks of Influenza similarly the use of boracic and weak saline solution for frequent irrigation of the naso-pharynx is recommended.

*\*Nursing.*—Satisfactory nursing is important in the prevention of complications and in aiding recovery from a severe attack. Sanitary Authorities have power, with the Board's sanction, to provide nursing assistance for those who are unable to provide it for themselves.

*Specific treatment.*—No vaccine is available for the treatment of Influenza, and although, in cases of primary pneumonia and bronchitis, treatment with a vaccine prepared from the particular pneumococcus or other organisms present in the secretions of the patient has sometimes been found useful, no such treatment can be recommended for the pulmonary complications of Influenza.

### General Measures.

*Specific prophylaxis.*—Prophylactic inoculation of a vaccine derived from a mixed culture of Pfeiffer's bacillus, of pneumococcus and streptococcus has given indications of possibly useful results. On this see Appendix, page 8.

Reliance should not be placed on this possible means of protection for the present. This vaccine is being prepared in limited quantities, but is not as yet procurable for the public. If it is not prepared under the conditions indicated on page 8 its use is not likely to have any success.

*Medicinal prophylaxis.*—Various attempts have been made to secure protection against an attack of epidemic catarrh by the inhalation of certain essential oils and by the administration of drugs such as quinine or cinnamon. All that can be said with certainty is that they do not ensure freedom from attack.

\*Gargling the throat with a solution of one in 5,000 permanganate of potassium in water containing 0·8 per cent. of common salt night and morning is to be recommended.

\*In addition, this solution should be poured into the palm of the hand, snuffed up through the nostrils and expelled through the mouth.

In the Army much use has been made of spray-rooms ; and a short description of these is given here in case it should be desired to have a similar experimental plant for persons in civilian

life who are especially exposed to infection, as for instance in institutions in which Influenza has already appeared. It cannot yet be regarded as proved that the spray-room reduces the incidence of attacks in exposed persons; and unless precautions are taken to separate patients from well persons, the spray-room may disseminate infection.

Spray-rooms can be installed wherever steam under a pressure of about 30 lbs. is available. A room about 18 ft. by 10 ft. is required, into which steam pipes of 1 in. internal diameter are led. These should be run along both sides of the room nearly horizontally, with a slight fall to draw-off valves or steam traps to prevent hot condensed water being ejected from the jets, of which, in a room of the size mentioned, there should be three on either side. A suitable height for the jets and pipes is 5 feet from the floor line. The jets, which are of a special type, have a second arm connected up by means of rubber tubing to a receptacle containing a 1 per cent. solution of zinc sulphate. The jets are regulated to discharge 100 cc. of this substance per minute, diffused in the spray of steam.

A chamber of the size suggested was originally intended to accommodate twenty patients at one time, but in order to reduce the risk of infection being carried from one individual to another by sneezing while in the chamber, it is advisable to reduce the number treated at each operation to not more than seven. If considerable numbers have to be treated, the spray-room accommodation will need to be increased proportionately. Treatment in the spray-room should persist for ten minutes on each occasion; and in order to obtain the best results should be repeated once daily for three consecutive days.

The room should be thoroughly flushed with fresh air before a second batch of patients are introduced for treatment.

*General prophylaxis*—Under the ordinary circumstances of civilian life dependence must be placed on general preventive measures. The precautions needing to be adopted by the patient himself have already been stated.

There are certain general precautions the observance of which would greatly limit the spread of infection.

\*The occurrence of epidemic catarrhs would be greatly decreased by continuous flushing with air of each occupied bedroom and living room. This implies the need for adequate warm clothing, especially for persons engaged in sedentary occupations and for children and old people.

\*Overcrowding in dwellings, or in unventilated assembly rooms and places of entertainment, should be avoided.

\*The aggregation of large numbers of persons in one room, especially for sleeping, is dangerous when catarrhs are prevalent, even though the floor space for each person may appear to be adequate. The smaller the unit of aggregation of persons, the less is the risk of infection.

\*Dirtiness, whether personal or of living or working rooms, and dusty conditions, favour infection. The wet cleansing of all invaded places is important.

\*Indiscriminate expectoration is always a source of risk of infection; and is especially dangerous during the prevalence of Influenza.

\*Persons with septic conditions of the mouth, teeth or nasopharynx are especially prone to catarrhal attacks. The treatment of these conditions is important.

\*Prolonged mental strain or over-fatigue, and still more alcoholism favour infection; and complication by pneumonia is especially fatal among immoderate drinkers.

\*It is particularly important that sick persons and old people should be protected against exposure to Influenza.

\*If every person who is suffering from Influenza or catarrh recognised that he is a likely source of infection to others, that some of the persons infected by him may die as the result of this infection, and took all possible precautions, the present disability and mortality from catarrhal epidemics would be materially reduced.

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Influenza should be regarded as a member of a group of catarrhal infectious diseases which in the aggregate are perhaps the chief enemies of human health. Other members of this group are the various forms of bronchitis and pneumonia, and a "common cold"—which may be the forerunner of bronchitis and pneumonia. Meningococcic infection may be placed in the same group, causing a merely saprophytic invasion in most instances, catarrh in other instances, and cerebro-spinal fever in very exceptional cases. Measles and whooping-cough are important members of the group, and it is not unlikely that poliomyelitis and encephalitis lethargica should also be included.

\*The only safe rule is to regard all catarrhal attacks and every illness associated with rise of temperature during the prevalence of influenza as infectious and to adopt appropriate precautionary measures.

Hitherto little attempt has been made to secure direct control over these diseases; and such control is only practicable by the active co-operation of each member of the community. Some of the lines for such co-operation have been indicated in this memorandum.

ARTHUR NEWSHOLME,

*Medical Officer.*

Local Government Board,

*October, 1918.*

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## APPENDIX.

By consent of the Director General of the Army Medical Service the following précis of the conclusions of a recent conference of bacteriological experts at the War Office is given.†

It is published here as embodying the most recent and authoritative views on the question of treatment and prevention of Influenza by vaccines.

1. It was unanimously agreed that inoculations with a suitable vaccine might be expected to be of value in controlling the incidence and severity of the epidemic.

## PROPHYLACTIC VACCINE.

2. As regards the appropriate constitution of such a vaccine, it was agreed that the three following organisms only should be employed—the *Bacillus influenzae*, the *Pneumococcus*, and the *Streptococcus*. In each instance it was decided that a number of different strains and types of each organism should be utilised in the preparation of the vaccine, and that these strains should have been recently isolated from cases occurring during the present epidemic, and should be submitted to strict tests as to race and type prior to use.

3. As to the relative proportions of the different organisms and dosage of the vaccine, it was agreed that the following should be its constitution and dosage :—

					1st Dose.	2nd Dose.
<i>B. influenzae</i>	...	...	...	...	30 millions.	60 millions.
<i>Pneumococcus</i>	...	...	...	...	100 "	200 "
<i>Streptococcus</i>	...	...	...	...	40 "	80 "

The vaccine should be sterilised by a temperature of 55° C., maintained for half an hour, and 0·5 per cent. of carbolic acid should subsequently be added as an antiseptic.

4. Whenever possible, two doses of the vaccine should be given at an interval of 10 days.

It was thought that the reactions to be expected from this vaccine would in the majority of cases be either trivial or non-existent. It was, however, considered to be of great importance that, in the case of soldiers, a period of 24–36 hours' light duty should always be given.

5. As regards the conditions under which this prophylactic vaccine should be employed, the conference were unanimous in considering that whilst it would be preferable to carry out the inoculations before exposure to infection, there do not exist any adequate grounds for withholding it in the case of a body of men amongst whom influenza had already appeared, provided that care was taken not to inoculate any individuals who have fever or are obviously ill, or those who are at the time suffering from catarrh.

At the same time, a careful watch should be kept for any evidence of a period of increased susceptibility following upon inoculation, and should this become manifest it is advised that instructions be given to lower the doses recommended above.

6. The conference made the following special recommendations as to dosage of the vaccine in the case of children :—

It is not advisable to inoculate children under the age of 3. For older children the following doses may be given :—

From 3–7 years ...	$\frac{1}{4}$ of the full doses as detailed in para. 3.
From 7–16 years ...	$\frac{1}{2}$ of the full doses as detailed in para. 3.
Above 16 years ...	The full dose.

† Those present at the Conference were Colonel Sir William Leishman, K.C.M.G., C.B., F.R.S. (Chairman), Deputy Surgeon-General P. W. Bassett-Smith, C.B., C.M.G., R.N., Lieut.-Colonel D. Harvey, C.M.G., Major F. W. Andrewes, F.R.S., Captain S. R. Douglas, and Dr. J. Eyre.



## VACCINE FOR TREATMENT.

7. As regards the employing of the above vaccine for the treatment of severe cases of influenza and its complications, the conference made the following recommendations :—

- (a) The vaccine is most likely to be of service in the treatment of sub-acute and of chronic cases ; in this class of case the initial dose which they recommend is one-fifth of the "first dose," as detailed in para. 3.
- (b) The use of the vaccine in the treatment of severe cases of secondary broncho-pneumonia cannot at present be recommended, in view of the dangerous rapidity and severity of many of these cases. Should it, however, be desired to try the vaccine in such cases, it is advised that the initial dose should not exceed one-twentieth of the "first dose," as detailed in para. 3.

8. As regards the preparation of the vaccine, on the assumption that considerable demands might be made for it at an early date, it was agreed that the numerous strains of the organisms which were in possession of most of the members of the conference, and which had been obtained from recent cases, should be sent to the inoculation department of St. Mary's Hospital, where they will be put through the necessary tests as to purity, type, &c. Those selected will then be passed to the R.A.M. College and the Royal Naval College, where the vaccine will be prepared.

9. In order to ascertain the degree of protection given by the vaccine, the conference recommend strongly that the necessary administrative steps be taken to secure statistical record dealing with the following matters :—

- (a) The reactions following the inoculations.
- (b) The occurrence of any cases of severe illness within 48 hours of inoculation.
- (c) The incidence of the disease among the inoculated and uninoculated.
- (d) The incidence of complications among the inoculated and uninoculated.

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1918.

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